

REMARKS

Claims 1-37 were pending, with claims 4, 13, 21-23 and 34 having been withdrawn by the Patent Office from examination. By this Amendment, claims 1, 2, 10 and 15 have been amended to clarify the claimed subject matter, and claim 8 has been canceled, without prejudice or disclaimer. Accordingly, claims 1-7 and 9-37 are now pending, with claims 1, 9, 10 and 15 being in independent form.

The title was objected to as purportedly not descriptive.

By this Amendment, the title has been amended.

Withdrawal of the objection to the title is respectfully requested.

Claims 1-3, 5-12, 14-19, 24-33 and 35 were rejected under 35 U.S.C. § 102(e) as purportedly anticipated by U.S. Patent No. 6,748,749 (Tsuda '749).

Applicant has carefully considered the Examiner's comments in the final Office Action dated March 26, 2007 and the cited art, and respectfully submits that independent claims 1, 9, 10 and 15 as amended are patentable over the cited art, for at least the following reasons.

This application relates to a magnetic resonance imaging (MRI) apparatus comprising a super-conducting magnet including a super-conducting coil circuit. Such apparatuses of a conventional construction can often experience problems induced by electro-magnetic interference from any one or more of various sources in the system which affects the ability of the system to deliver high-quality images. For example, Applicant found that a closed loop circuit is formed between on the one hand an external control circuit or monitor circuit and on the other hand the super-conducting coil circuit through electro-magnetic coupling, and that the electromagnetic coupling is sufficiently large such that when varying magnetic fluxes due to the gradient magnetic

field and the high frequency magnetic field generated in association with the imaging operation in the MRI apparatus pass through the closed loop circuit, an induced current flows in the closed loop circuit to cause the control circuit and the monitor circuit to erroneously operate and cause the super-conducting state of the super-conducting coil circuit to be broken.

Applicant devised various improvements.

For example, in one improvement, means for interrupting formation of a closed loop circuit passing through the control circuit or the monitor circuit and the super-conducting coil circuit is provided inside a shielded examination room (which accommodates the super-conducting magnet) and disposed between the super-conducting magnet and the control circuit or the monitor circuit (claim 1 of present application).

In another improvement, means for preventing high frequency current induced by the gradient magnetic field coils or the high frequency magnetic field coils from flowing in from the control circuit or the monitor circuit to the super-conducting coil circuit is provided inside the shielded examination room and disposed between the super-conducting magnet and the control circuit or the monitor circuit (claim 10 of present application).

In another improvement, means for interrupting noise current generated based on tomographic image measurement of the subject is provided and disposed outside the super-conducting magnet and inside the shielded examination room while being inserted between the electrical circuit and the super-conducting magnet (claim 15 of present application).

Such features are described in more detail in the application at, for example, page 11, lines 17-21, page 14, lines 5-8, page 25, lines 1-4, page 29, line 4 through page 30, line 3 and in Figs. 1 and 9, and are not taught nor suggested by Tsuda '749.

Tsuda '749 proposes a magnetic resonance imaging apparatus using a super conducting magnet, wherein a filter circuit 15 is provided so as to minimize the influence of magnetic wave noises.

The filter circuit 15 of Tsuda '749 is apparently equated in the Office Action to the interrupting means of claim 1 of the present application.

However, as previously pointed out in the record, the filter circuit 15 is provided at the outside entrance of the shielded examination room and is intended to prevent RF noises from entering into the shielded examination room from the outside.

The line filter 15 of Tsuda '749 does not disclose or suggest, however, means for interrupting formation of a closed loop circuit passing through the control circuit or the monitor circuit and super-conducting magnet and provided inside a shielded examination room (which accommodates the super-conducting magnet) between the super-conducting magnet and the control circuit or the monitor circuit, as provided by the subject matter of claim 1 of the present application.

Likewise, Tsuda '749 does not teach or suggest (a) means for preventing high frequency current induced by the gradient magnetic field coils or the high frequency magnetic field coils from flowing in from the control circuit or the monitor circuit to the super-conducting coil circuit and provided inside the shielded examination room between the super-conducting magnet and the control circuit or the monitor circuit (claim 10 of present application), and (b) means for interrupting noise current generated based on tomographic image measurement of the subject and disposed outside the super-conducting magnet inside the shielded examination room while being inserted between the electrical circuit and the super-conducting magnet (claim 15 of present application).

Such features prevent occurrence of the quenching phenomenon caused by a local current

in a closed loop circuit which can be induced by leakage magnetic fluxes caused by the RF coils and the gradient magnetic coils (see page 3, line 20 through page 4, line 17, and page 24, line 5 through page 26, line 20 of the present application). The leakage magnetic fluxes, which cause the quenching phenomenon, are induced not at the outside of the shielded examination room, but rather inside of the shielded examination room. When the interrupting means (the filter and the normally open switch) is disposed inside the shielded examination room, the local current flow in a closed loop circuit which can be induced by leakage magnetic fluxes caused by the RF coils and the gradient magnetic coils can be prevented, which can never be achieved by the filter #15 in Tsuda '749 which is disposed at the outside entrance of the shielded examination room.

Regarding claim 9 of this application, it is noted that although claim 9 was rejected, no support was provided for the rejection of claim 9.

Applicant maintains that Tsuda '749 does not teach or suggest a super-conducting magnet device comprising a super-conducting coil circuit having a super-conducting coil and a permanent current switch for controlling a permanent current flowing through the super-conducting coil and a vessel accommodating the super-conducting coil at a temperature for maintaining the same in super-conducting state characterized, in that the vessel is provided with a terminal portion for connecting a heater element or a sensor element disposed in the vessel to an external circuit and the terminal portion is provided with means for forming a closed loop circuit including the external circuit, an outer wall of the vessel and a grounding point provided at the wall, as provided by the subject matter of claim 9 of the present application.

Accordingly, for at least the above-stated reasons, Applicant respectfully submits that independent claims 1, 9, 10 and 15, and the claims depending therefrom, are patentable over the cited

art.

The Office Action indicates that claim 20 is objected to as being dependent upon a rejected base claim but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. However, since independent claim 15 from which claim 20 depends is submitted to be patentable over the cited art, no changes to the form of claim 20 is believed to be necessary.

In view of the remarks hereinabove, Applicant submits that the application is now in condition for allowance. Accordingly, Applicant earnestly solicits the allowance of the application.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition. The Patent Office is hereby authorized to charge the additional claims fees and any additional fees that are required in connection with this amendment and to credit any overpayment to our Deposit Account No. 03-3125.

If a telephone interview could advance the prosecution of this application, the Examiner is respectfully requested to call the undersigned attorney.

Respectfully submitted,



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